

PCT/GB2004/004572



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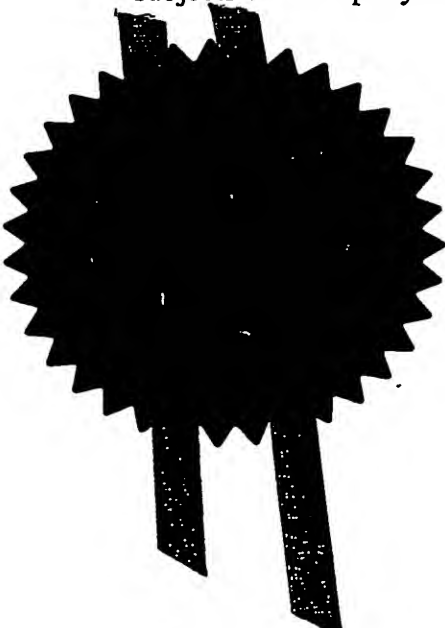
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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed

*W. Evans*

Dated 7 December 2004

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Patents Form 1/77  
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The  
Patent  
Office

30OCT03 ES48161-13 002917  
P01/7700 0.00-0325249.1  
30OCT03 ES48161-13 002917

## Request for grant of a patent

The Patent Office  
Cardiff Road  
Newport  
South Wales NP10 8QQ

1. Your reference 5484201/JAC

2. Patent Application Number 0325249.1 29 OCT 2003

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

Innovision Research & Technology PLC  
Ash Court  
23 Rose Street  
Wokingham  
Berkshire  
RG40 1XS

8144784001

Patents ADP number (*if known*)

If the applicant is a corporate body, give the  
country/state of its incorporation

Country: England  
State:

4. Title of the invention  
DUAL MODE READER / TAG ARCHITECTURE

5. Name of agent Beresford & Co

"Address for Service" in the United Kingdom  
to which all correspondence should be sent

2-5 Warwick Court  
High Holborn  
London WC1R 5DH

Patents ADP number

1826001

6. Priority: Complete this section if you are declaring priority from one or more earlier patent  
applications filed in the last 12 months.

Country

Priority application number

Date of filing

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# Patents Form 1/77

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute.

Number of earlier application

Date of filing

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

YES

9. Enter the number of sheets for any of the following items you are filing with this form.

Continuation sheets of this form

Description

2

Claim(s)

1

Abstract

Drawing(s)

1

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents form 7/77*)

1 + 1

Request for preliminary examination and search (*Patents Form 9/77*)

Request for Substantive Examination (*Patents Form 10/77*)

Any other documents  
(*please specify*)

11. I/We request the grant of a patent on the basis of this application

Signature

*Beresford*

BERESFORD & Co

Date 29 October, 2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Jane Clark

Tel: 020 7831 2290

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## Dual Mode Reader / Tag Architecture

### *Background*

The growth and diversity of RFID applications is progressing at an exponential rate. The existing RFID system concepts, based on isolated Reader and Tag functionality, do not necessarily provide the optimum system level solution for an ever-increasing diversity of application areas. Many of these emerging application areas may require each element within the RFID system to possess dual mode Reader / Tag functionality, analogous to the transceiver functionality that exists within radio transmission equipment today.

Several technical problems need to be addressed to realise a dual mode Reader / Tag functionality. Firstly, for a dual antenna solution, close proximity of the antennas will result in interference between the antennas. This effect is especially acute for proximity or vicinity coupled RFID where the coupling mechanism is magnetic. The solution to this problem would involve either positioning the antennas at mutual magnetic nulls, or including an enable/disable function for the Reader antenna. Both of these solutions are likely to result in increased complexity, cost and size of the dual mode solution. Secondly, for a single antenna solution, the inherently different properties of the Reader and Tag antennas could result in range reduction due to insufficient modulation depth depending on the design of the antenna. The following sections outline the IRT proposed solution for a single antenna dual mode Reader / Tag functionality. The IRT proposed solution achieves maximum range performance, with minimal increase in circuit complexity, without a significant size or cost penalty compared to a conventional single mode Reader / Tag system.

### *Proposed Solution Operational Overview*

An example proposed solution is illustrated in Figure 1. In Reader mode the switch, or other control element, is set to connect the driver stage with the antenna, or antennas, as in a conventional Reader configuration. In Tag mode (which could be the default condition) the switch, or other control element, is temporarily set to connect the antenna, or antennas, with the phase detector, or other receiving circuitry. This enables, for example, the internal VCO to be phase locked to the incoming signal. Once phase lock has been detected using lock detect the sample and hold is enabled and the switch toggled back to the Reader mode. This enables the controller to generate a transmit signal using the modulator, driver and AGC loop. Modulation of the incoming signal is achieved by phase and amplitude control of the transmit signal, set to either cause destructive or constructive interference with the incoming signal at the antenna, or antennas. The transmit signal is isolated from the phase detector, or receiving circuitry using the switch, or control element. Once the transmit burst has been sent

the switch, or control element can then be toggled back into Tag mode and the cycle repeats until transmit signals have been generated in response to all incoming signals.

### ***Benefits of Proposed Solution***

The example proposed solution has a major benefit over conventional passive Tag operation. With a conventional passive Tag the modulation depth is limited by the energy of the incoming signal. With the proposed solution this limitation is removed, as the modulation depth is dependent on the energy that can be generated by the driver stage, which is independent of any external signals or circuitry.

The example proposed solution may also be used with other forms of antenna or multiple antennas, and other coupling mechanisms, such as far field electromagnetic, acoustic, optical etc.

Other examples of the proposed solution would include but are not limited to,

- Injection Locking receiving circuitry
- Parametric amplifying receiving circuitry
- Delay lock loop receiving circuitry

ims

1. A Reader architecture than can emulate TAG functionality.
2. A dual mode Reader / Tag architecture using a phase locking technique for the Tag mode of operation.
3. A dual mode Reader / Tag architecture where Tag modulation depth is independent of the energy of the incoming Reader signal.

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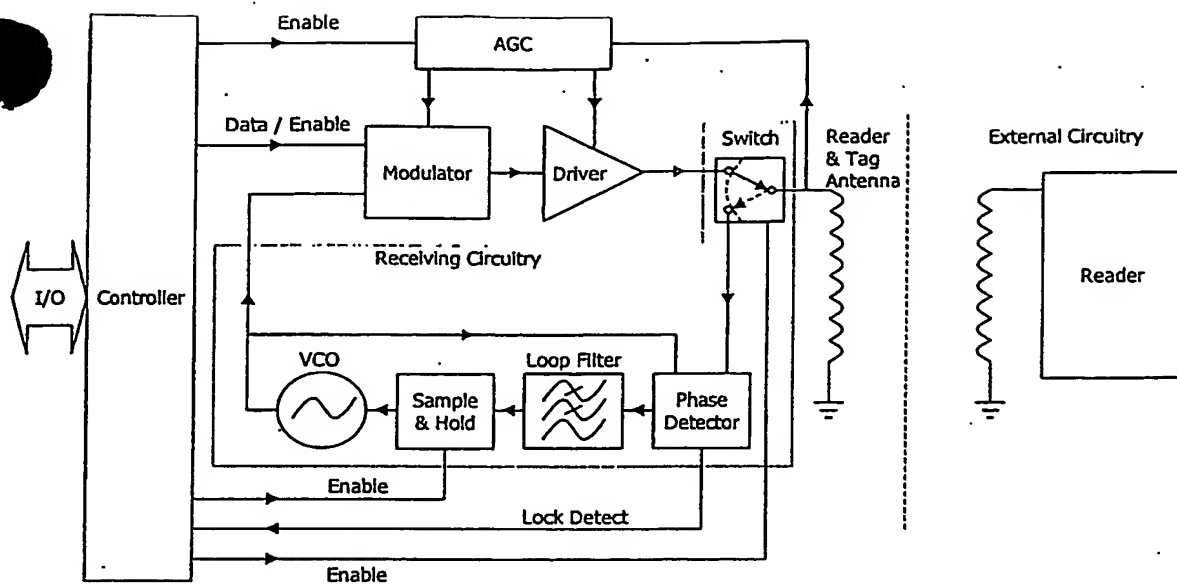


Figure 1: IRT Dual Mode Reader / Tag Solution

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